



## Remote Sensing of Complex Flows by Doppler Wind Lidar: Summary of Issues and Preliminary Recommendations from IEA Wind Task 32 Phase 1

Andy Clifton

IEA Wind Task 32 General Meeting

Glasgow, Scotland

December 15, 2016

[NREL/PR-5000-67643](#)

# What We Did and Why

## The Challenge

- How do you use wind lidar in complex flow with confidence?

## The Problems

- Lidar and point measurements do not always agree
- We did not have a way to really compare results or situations
- Lidar may be being unfairly penalized

## The Solutions

- Definition of complex flow
- Use cases to constrain the problem
- Report on the state of the art.

### The Report Team:

Andrew Clifton, *National Renewable Energy Laboratory*

Matthieu Boquet, *Leosphere*

Edward Burin Des Roziers and Annette Westerhellweg, *UL International GmbH – DEWI*

Martin Hofstätter, *Stuttgart Wind Energy*

Tobias Klaas, *Fraunhofer Institute for Wind Energy and Energy System Technology*

Klaus Vogstad, *Meventus*

Peter Clive, *Sgurr Energy*

Mike Harris and Scott Wylie, *ZephIR Limited*

Evan Osler, *Renewable NRG Systems*

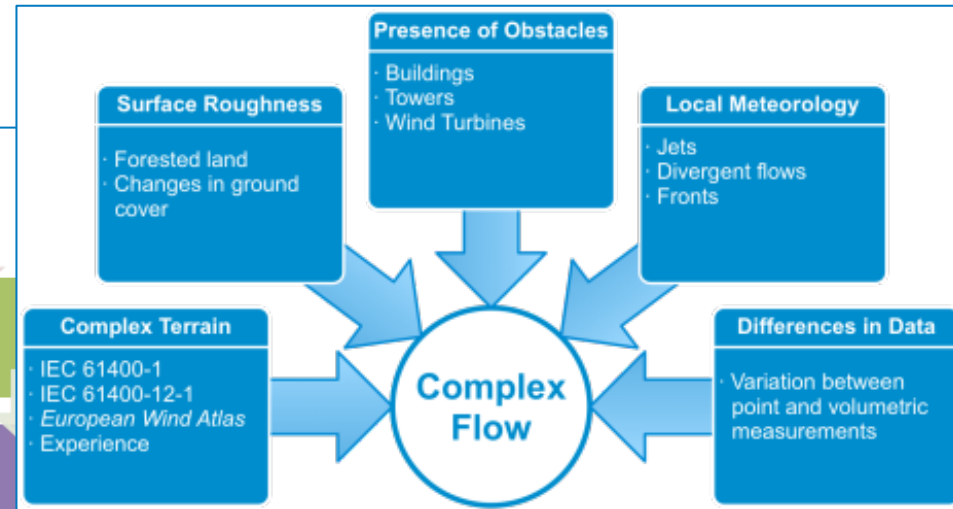
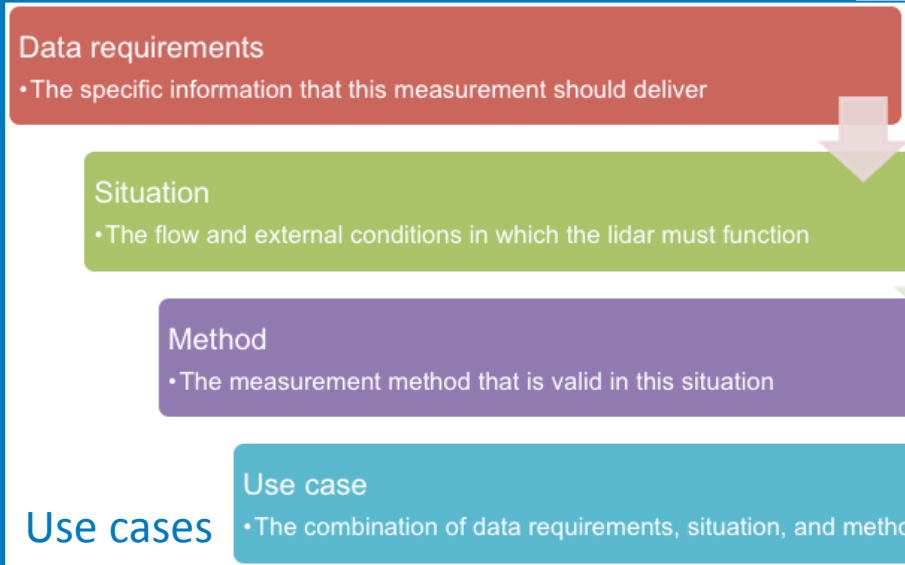
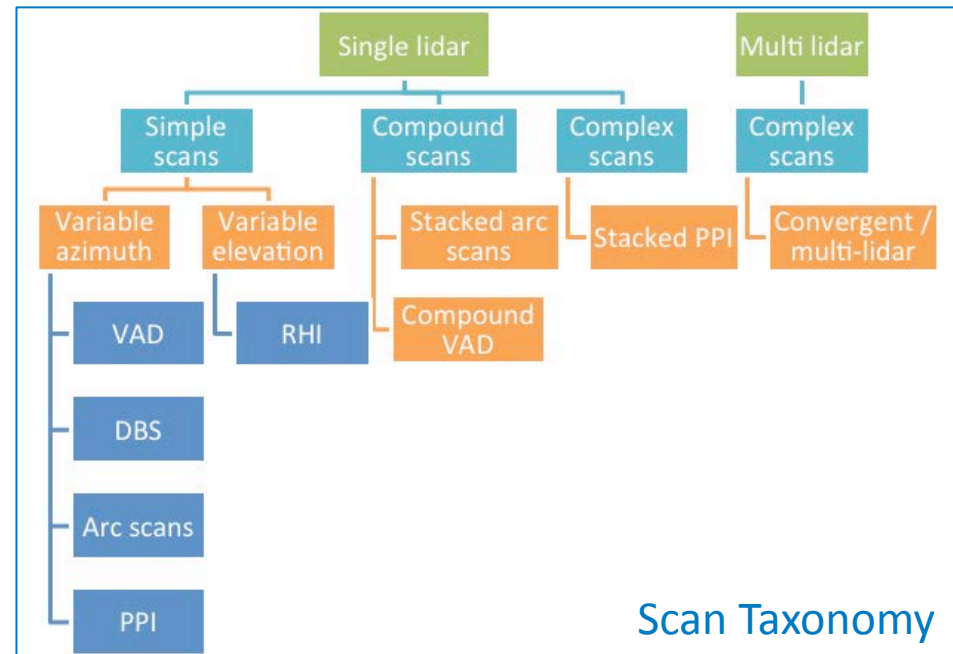
Bob Banta and Aditya Choukulkar, *National Oceanic and Atmospheric Administration*

Julie Lundquist and Matthew Aitken, *University of Colorado Boulder*

***And many others along the way...***

# Major Results

- Definition of complex flow
- Scan taxonomy
- Use case library
- Preliminary recommendations.



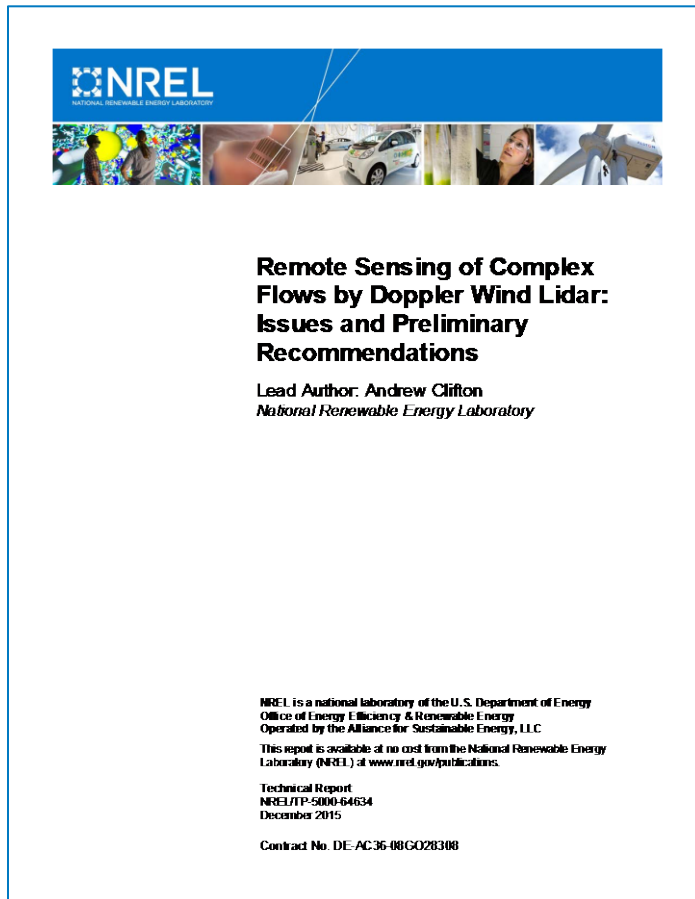
Definition of "Complex Flow"

# Preliminary Recommendations (2015)

- Defer to 61400-12-1 for power performance...
- ...and IEA Wind RP 15 “Ground-based vertically-profiling remote sensing for wind resource assessment” for vertical-profiling devices
- In complex flow cases:
  - Define complex flow based on terrain or meteorological conditions (not subjectively)
  - Validate use cases
  - Aim for site- and flow-specific (use-case-specific?) uncertainty estimates.

# Current Situation and What's Next

## Summary Report



## Activities in Phase 2

- Addressed in site assessment and complex flow topic areas
  - Floating lidar workshop (#1) and RP
  - Wake measurements workshop (#3).

## What do you need next?

Talk to the Advisory Board contacts:

- Julia Gottschall
- Davide Trabucchi
  - Detlef Stein
  - Peter Clive

[www.nrel.gov/docs/fy16osti/64634.pdf](http://www.nrel.gov/docs/fy16osti/64634.pdf)

Let's talk!

andrew.clifton@nrel.gov

+1 303 513 0095



A multimegawatt wind turbine and 1-megawatt photovoltaic field at the National Wind Technology Center at the National Renewable Energy Laboratory. *Photo by Dennis Schroeder, NREL*